

# **HEALTH CONSULTATION**

**SAM A. BAKER STATE PARK  
PATTERSON, WAYNE COUNTY, MISSOURI**

November 23, 2004

Prepared by the:

Missouri Department of Health and Senior Services  
Division of Environmental Health and Communicable Disease Prevention  
Section for Environmental Public Health  
Under Cooperative agreement with the  
Agency for Toxic Substances and Disease Registry

## **STATEMENT OF ISSUES AND BACKGROUND**

### **Statement Of Issues**

The Missouri Department of Natural Resources (MDNR) has asked the Missouri Department of Health and Senior Services (DHSS) to complete a health consultation for Sam A. Baker State Park. The park is 15 miles southeast of the Annapolis Lead Mine site. Sutton Branch Creek drains the Annapolis Lead Mine site and empties into Big Creek, which flows through Sam A. Baker State Park. This health consultation will examine recent sampling results from Sam A. Baker State Park, contaminant concentrations, exposure potential, and the corresponding threat to public health.

### **Background**

Sam A. Baker State Park was created in 1926 near Patterson, in Wayne County, Missouri. The park is near the St. Francois Mountains in southern Missouri. It attracts people for swimming, hiking, fishing, observing wildlife, bicycling, and camping. Canoeing and kayaking are possible on Big Creek and the St. Francois River (1).

Approximately 15 miles upstream from Sam A. Baker State Park is the Annapolis Lead Mine Site (CERCLIS ID# MO00009568611), in Iron County, Missouri (Figure 1). The Annapolis Lead Mine site is part of Missouri's Old Lead Belt and was proposed to the United States Environmental Protection Agency's (EPA) National Priorities List (NPL) on March 8, 2004. The site was formally added to the NPL on July 22, 2004. The NPL is a list of hazardous waste sites that are eligible for extensive, long-term cleanup.

The Annapolis Lead Mine operated from approximately 1919 until 1940 (2). At the mine site, quantities of ore were mined, crushed, concentrated and stored on-site before being shipped to an off-site smelter. The wastes (tailings and chat) from crushing and concentrating the ore were disposed of on-site in a small ravine through which flows Sutton Branch Creek. Approximately 1,173,000 tons tailings and chat were left on approximately 10 acres at this site (2,3). Tailings/chat piles in Missouri's Old Lead Belt contain measurable amounts of lead, antimony, cadmium, copper, calcium, iron, magnesium, nickel, silver, and thallium. The tailings are classified as medium to fine sand-sized particles that are a waste product of the froth floatation-level extraction process. Tailings/chat piles are unstable and easily affected by wind and water erosion. Chat is defined as crushed ore material three-eighths inch or less in diameter. For simplification, this health consultation will refer to tailings and chat as tailings.

As a result of the topography of the Annapolis Lead Mine site and the physical characteristics of tailings, contaminated lead mine tailings from the Annapolis Lead Mine site have washed downstream over time. Approximately half of the tailings pile has eroded. Previous water and sediment samples taken downstream of the ravine that drains the tailings pile demonstrated that elevated levels of lead, arsenic, cadmium, zinc, nickel, and copper exist in the sediments of the receiving stream, Sutton Branch Creek, which empties into Big Creek. The DHSS is currently

developing a Public Health Assessment for the Annapolis Lead Mine site as required by the federal Agency for Toxic Substances and Disease Registry (ATSDR) for all sites added to the NPL.

Recently, residents have expressed concern that the contaminated runoff from the Annapolis Lead Mine site has affected the water, soil, and sediment of Big Creek in Sam A. Baker State Park. Residents of the area and visitors to the park are concerned that arsenic, cadmium, lead, thallium, and zinc could be leaching out of the tailings pile at the Annapolis Lead Mine site and contaminating the water, sediment, and soil of Sutton Branch and, consequently, Big Creek.

EPA is conducting a time-critical removal action at the Annapolis site. The removal action will stabilize the tailings pile to prevent further erosion of the tailings into Sutton Branch and Big Creek. EPA has constructed settling basins on-site to prevent further tailings from reaching Sutton Branch and Big Creek. EPA expects the removal action to be completed in late 2004.

The MDNR conducted tests of the water and sediment in Big Creek in Sam A. Baker State Park on May 27, 2004, to determine if the runoff from the tailings piles has affected Big Creek. Water, soil, and sediment samples were taken at four locations throughout the park. The sampling locations were high traffic areas near a boat launch, in a swimming area, in a picnic area, and in Big Creek near a crossing. Figure 2 is a map of Sam A. Baker State Park (4). Tables 1, 2, and 3 list the levels of contaminants found in the park.

## **DISCUSSION**

Contaminant levels in the on-site soils were compared to background levels typically found in soils of that area. Tables 1 and 3 list the background levels for the specific contaminants. Cadmium, copper, lead, nickel, and zinc were found in the surface soil at levels above typical background levels (5,6). Cadmium is typically non-detectable in soils in that area, but was detected in low levels in the sediment of Big Creek. No other contaminants were at levels above background in the sediment of Big Creek.

Contaminant levels were also compared to ATSDR comparison values (CVs) when available. ATSDR has developed CVs that are media-specific concentrations used by health assessors to select environmental contaminants of concern. Contaminant concentrations less than the CV are unlikely to pose a health threat. Contaminant levels above the CV do not necessarily indicate that a health threat is present, but that further evaluation of the chemical and pathways is needed. ATSDR CV levels are not available for all contaminants. In those cases, EPA maximum contaminant levels (MCL) or MDNR cleanup levels for Missouri (CALM) were used for comparison. An MCL is the maximum concentration of a contaminant allowed by EPA in public drinking water. CALM values are risk-based soil and groundwater cleanup levels based on land use and the varied human exposure those land uses imply. CALM values are designed protect human health and the environment. EPA has established an action level for lead to protect public health and to serve as a CV for which concentrations detected above the action level warrant a removal action.

Lead levels found in the sediment, soil, and water were significantly below action levels set by EPA. All other contaminants were below comparison values.

## **CONCLUSIONS**

As a result of the recent sampling of the sediment, soil, and water in Sam A. Baker State Park, it has been determined that there is *No Apparent Health Hazard* for residents in the area or visitors to the park. The *No Apparent Public Health Hazard* category is for sites at which human exposure to contaminants is occurring, or has occurred in the past, but the exposure is below a level of health hazard. This classification was based on the following conclusions:

1. Contaminants were not found to be at levels of concern.
2. Removal actions currently being conducted by the EPA will prevent further migration of contaminants from the Annapolis Mine Site.

## **RECOMMENDATIONS**

1. EPA should complete the removal action at the Annapolis Mine Site in order to prohibit further erosion of the tailings pile.
2. MDNR should continue to monitor the sediment, soil and water in Big Creek.

## **PUBLIC HEALTH ACTION PLAN**

This public health action plan (PHAP) for the Sam A. Baker State Park contains an explanation of actions to be taken by the Missouri Department of Health and Senior Services (DHSS), the Agency for Toxic Substance and Disease Registry (ATSDR), and other stakeholders. The purpose of the plan is to ensure that this health consultation not only identifies public health hazards, but also provides an action plan to mitigate and prevent adverse human health effects resulting from past, present, and future exposures to hazardous substances at or near the site. Below is a list of commitments of public health actions to be implemented by DHSS, ATSDR, or other stakeholders at the site:

1. DHSS/ATSDR will coordinate with MDNR/EPA to implement the recommendations in this health consultation to eliminate or lessen exposure to the contaminants.
2. DHSS/ATSDR will review additional sampling data as they become available and provide guidance regarding possible health risk.
3. DHSS/ATSDR will continue to address community health concerns and questions as needed, and provide necessary education for the community and health professionals.

4. DHSS/ATSDR will update this public health consultation if there is a need to assess additional exposures.
5. DHSS/ATSDR will address the Annapolis Lead Mine site in a Public Health Assessment.

**Report Prepared by:**

Kristi Campbell, Cherri Baysinger,  
Missouri Department of Health and Senior Services

**Attachments:**

Figure 1. Map of Annapolis in relation to Sam A. Baker State Park

Figure 2. Map of Sam A. Baker State Park

Table 1. Surface Soil Sampling Results from the May 2004 Sampling  
Event

Table 2. Water Sampling Results from the May 2004 Sampling  
Event

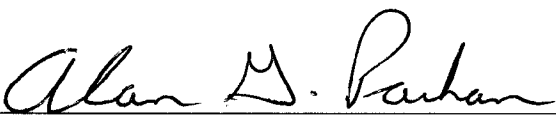
Table 3. Sediment Sampling Results from the May 2004 Sampling  
Event

## REFERENCES


1. Sam A. Baker State Park. General Information. [www.dnr.mo.gov](http://www.dnr.mo.gov).
2. US Environmental Protection Agency. Annapolis lead mine site proposed to the National Priorities List. Iron County, Missouri. 2004 March.  
[http://www.epa.gov/region07/news\\_events/factsheets/fs\\_annapolis\\_lead\\_proposed\\_npl\\_iron\\_cty\\_mo0304.pdf](http://www.epa.gov/region07/news_events/factsheets/fs_annapolis_lead_proposed_npl_iron_cty_mo0304.pdf)
3. Annapolis Lead Mine Site. On-Scene Coordinator.  
[http://www.epaosc.org/site\\_profile.asp?site\\_id=MO0000958611](http://www.epaosc.org/site_profile.asp?site_id=MO0000958611).
4. Missouri Department of Natural Resources. Environmental services program sampling results report. 2004 August 9.
5. Tidball, R. 1984. Geochemical survey of Missouri. Washington, DC: US Government Printing Office.
6. Schalk, GK. Holmes, RR, Jr. Johnson, GP. 1993. Floods in the Upper Mississippi River Basin, U.S. Geological Survey Circular 1120-L. Virginia: U.S. Geological Survey. p. 28.
7. <http://www.mapquest.com/maps/map.adp?country=US&countryid=US&addtohistory=&searchtab=address&searchtype=address&address=&city=Annapolis&state=MO&zipcode=&search=++Search++>

## CERTIFICATION

This Sam A. Baker State Park Health Consultation was prepared by the Missouri Department of Health and Senior Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was initiated.

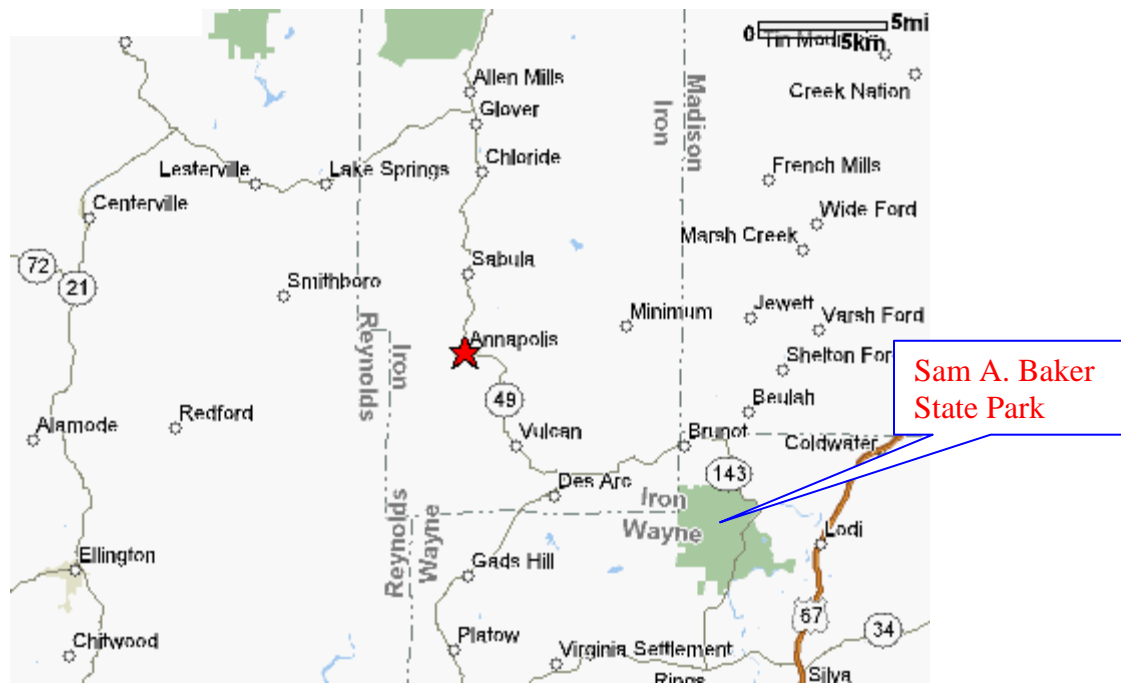
  
Technical Project Officer, CAT, SPAB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.

  
Section Chief, CAT, SPAB, DHAC, ATSDR  
*FOR DDD: ER/NEIN*



**Figure 1. Map of Annapolis in relation to Sam A. Baker State Park**

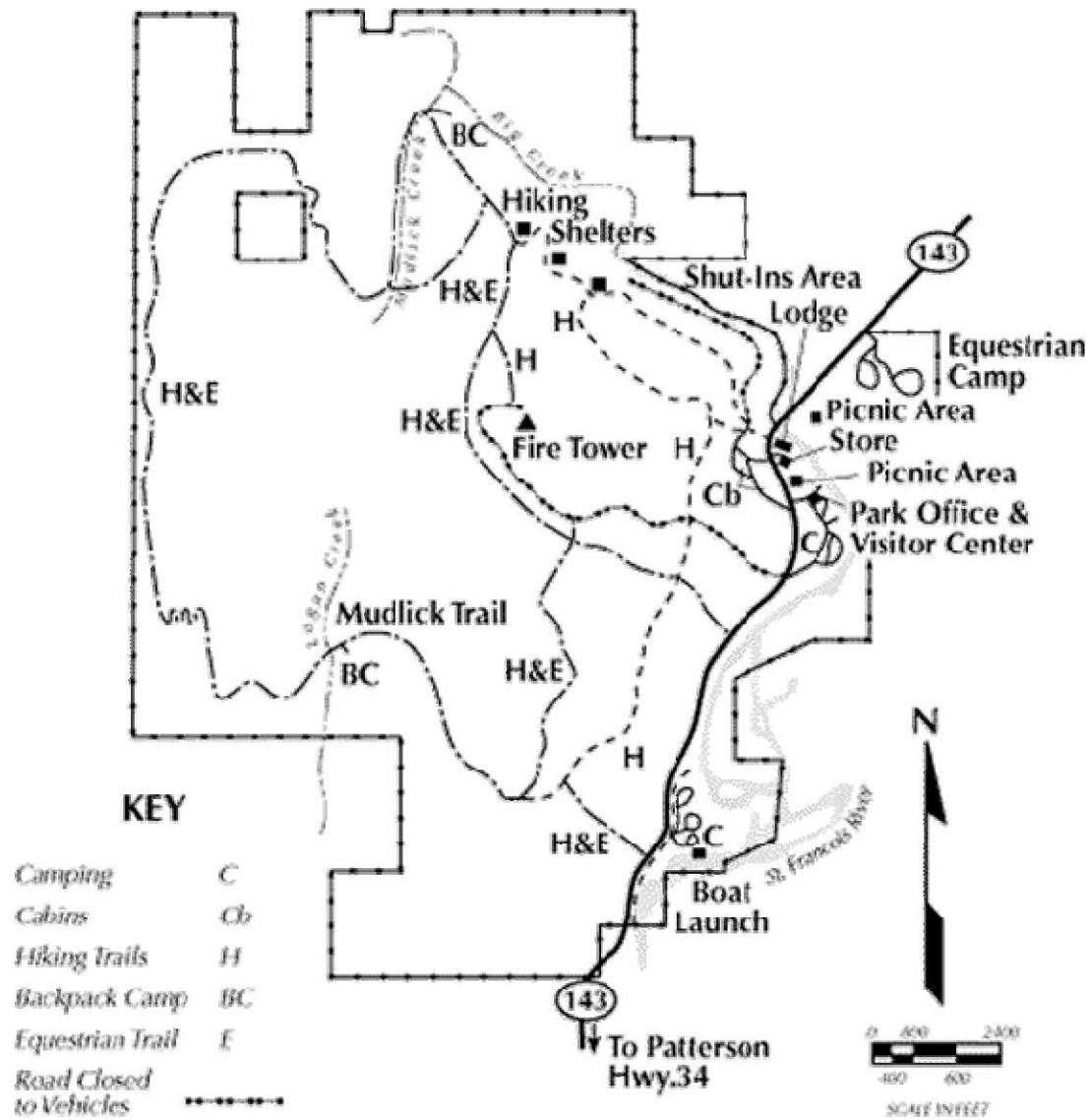


**Source:**

<http://www.mapquest.com/maps/map.adp?country=US&countryid=US&addtohistory=&searchtab=address&searchtype=address&address=&city=Annapolis&state=MO&zipcode=&search=++Search++>

Figure 2. Map of Sam A. Baker State Park

## SAM A. BAKER STATE PARK



Source: <http://www.mostateparks.com/baker/map.htm>

**Table 1. Surface Soil Sampling Results from May 2004 Sampling Event**

Sample #	Media	Arsenic (ppm)	Cadmium (ppm)	Chromium (ppm)	Copper (ppm)	Lead (ppm)	Nickel (ppm)	Thallium (ppm)	Zinc (ppm)
SS-01	Surface Soil	2.030	0.199	12.400	5.650	19.300	6.360	1.000	24.900
SS-02	Surface Soil	3.240	0.347	12.700	5.050	16.600	6.180	1.000	17.100
SS-03	Surface Soil	5.240	2.530	16.400	19.200	123.000	14.900	0.766	71.100
SS-04	Surface Soil	2.690	0.557	11.700	6.170	28.100	7.090	1.000	22.600
<b>Comparison Value</b>	Soil	*Chronic 20, child 200, adult	*Chronic 10, child 100, adult	‡2,100	*Intermediate 60, child 2000, adult	†400	*RMEG 1000, child 10,000 adult	‡17	*Chronic 20,000 child 200,000 adult
<b>Background Levels§</b>	Soil	8-10	Non-detect	60-80	12-18	18-25	9-13	Not available	30-40

\*ATSDR Soil Comparison Values:

Chronic-exposure that occurs for more than one year.

Intermediate-exposure that occurs for more than 15 days but less than one year.

RMEG-Reference Dose Media Evaluation Guide.

†EPA Action Level for Lead. No ATSDR comparison value available.

‡Missouri Department of Natural Resources Cleanup Levels for Missouri. No ATSDR comparison value available.

§Background levels are area specific approximations determined from Geochemical Survey of Missouri (1984) and Floods in the Upper Mississippi River Basin (1993).

**SS-01** (0422893) Surface soil grab from top of St. Francois River boat launch within park.

**SS-02** (0422898) Surface soil grab 20 ft from L descending bank of Big Creek-within “Shut-ins” swimming area.

**SS-03** (0422901) Surface soil grab adjacent to base of stairs that leads to picnic area behind park’s Visitor Center.

**SS-04** (0422904) Surface soil grab 10 ft from R descending bank Big Creek at downstream Equine crossing.

**Table 2. Surface Water Sampling Results from May 2004 Sampling Event**

Sample #	Media	Arsenic (ppm)	Cadmium (ppm)	Chromium (ppm)	Copper (ppm)	Lead (ppm)	Nickel (ppm)	Thallium (ppm)	Zinc (ppm)
WS-01	Surface Water	0.001	0.00025	0.00025	0.00155	0.00159	0.00116	0.00025	0.00399
WS-02	Surface Water	0.001	0.00025	0.00027	0.00124	0.00025	0.00047	0.00025	0.00763
WS-03	Surface Water	0.001	0.00025	0.00031	0.00111	0.00031	0.00055	0.00025	0.00257
WS-04	Surface Water	0.001	0.00025	0.00041	0.00131	0.00027	0.00069	0.00025	0.0052
<b>Comparison Value</b>		*Chronic 0.003, child 0.01, adult	*Chronic 0.002, child 0.007, adult	†0.1	*Intermediate 0.3, child 1, adult	‡15	*RMEG 0.2, child 0.7, adult	†0.002	*Chronic 3, child 10, adult

\*ATSDR Drinking Water Comparison Values:

Chronic-exposure that occurs for more than one year.

Intermediate-exposure that occurs for more than 15 days but less than one year.

RMEG-Reference Dose Media Evaluation Guide.

†EPA Maximum Contaminant Level. No ATSDR comparison value available.

‡EPA Action Level for Lead. No ATSDR comparison value available.

**WS-01** (0422894) Surface water grab from St. Francois River-below confluence with Big Creek-adjacent to boat launch within park.

**WS-02** (0422896) Surface water grab from Big Creek-within “Shut-ins” swimming area.

**WS-03** (0422899) Surface water grab from Big Creek-swimming area behind park’s Visitor Center.

**WS-04** (0422902) Surface water grab from Big Creek-at downstream Equine creek crossing.

**Table 3. Sediment Sampling Results from May 2004 Sampling Event**

Sample #	Media	Arsenic (ppm)	Cadmium (ppm)	Chromium (ppm)	Copper (ppm)	Lead (ppm)	Nickel (ppm)	Thallium (ppm)	Zinc (ppm)
SD-01	Sediment	4.800	0.150	12.500	5.570	11.700	5.910	0.100	24.200
SD-02	Sediment	2.260	0.321	13.400	4.100	15.100	4.740	0.100	15.400
SD-03	Sediment	4.860	0.166	11.800	4.360	8.370	4.800	0.100	14.300
SD-04	Sediment	3.120	0.304	12.900	4.030	15.600	5.430	0.100	17.800
<b>Comparison Value</b>	Soil	*Chronic 20, child 200, adult	*Chronic 10, child 100, adult	‡2,100	*Intermediate 60, child 2000, adult	†400	*RMEG 1000, child 10,000 adult	‡17	*Chronic 20,000 child 200,000 adult
<b>Background Levels§</b>	Soil	8-10	Non-detect	60-80	12-18	18-25	9-13	Not available	30-40

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‡Missouri Department of Natural Resources Cleanup Levels for Missouri. No ATSDR comparison value available.

§Background levels are area specific approximations determined from Geochemical Survey of Missouri (1984) and Floods in the Upper Mississippi River Basin (1993).

**SD-01** (0422895) Sediment grab from St. Francois River-below confluence with Big Creek-adjacent to boat launch within park.

**SD-02** (0422897) Sediment grab from Big Creek-within "Shut-ins" swimming area.

**SD-03** (0422900) Sediment grab from Big Creek-swimming area behind park's Visitor Center.

**SD-04** (0422903) Sediment grab from Big Creek-at downstream Equine creek crossing.